Citation:

Matthys C, De Henauw S, Bellemans M, De Maeyer M, De Backer G. Breakfast habits affect overall nutrient profiles in adolescents. *Public Health Nutr*. 2007 Apr; 10 (4): 413-421.

PubMed ID: 17362538

Study Design:

Cross-sectional survey

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To describe breakfast consumption patterns, on a nutrient and food item level, in Belgian adolescents.

Inclusion Criteria:

- Adolescents (13 to 18 years old)
- Attending secondary school
- Willing to complete a seven consecutive day food record (semi-structured diary)
- The study was approved by the Ethical Committee of the Ghent University Hospital.

Exclusion Criteria:

- Younger than 13 and older than 18 years of age
- Not enrolled or attending secondary school
- Unwilling to complete a seven-day food record (semi-structured diary).

Description of Study Protocol:

Recruitment

Done by randomly sampling 341 adolescents (129 boys and 212 girls); selected from all educational levels in the Belgian secondary school system.

Design

Cross-sectional study.

Dietary Intake/Dietary Assessment Methodology

A seven-day food record (consecutive) under rigorous conditions of quality control carried out by experienced dietitians.

Intervention

No intervention, one time (seven-day) data collection.

Statistical Analysis

- Statistical analysis was done with the SPSS software version 12 (SPSS Inc.)
- Descriptive statistics used means and standard deviations for continuous data. Tests for normality were performed using a Kolmogorov-Smirnov test
- Student's T-tests or Mann–Whitney U-tests were used to compare the means of the different groups
- In order to search for potential confounders, the number of adolescents in different categories of body mass index (BMI) and education, 'general' education (mainly theoretical courses) and vocational training (based on practical skills), in the different breakfast classifications were compared by use of a Fisher's exact test
- A value of <0.05 was taken as the threshold for significance.

Data Collection Summary:

Timing of Measurements

One-time data collection (seven-day food diary).

Dependent Variables

Energy and Nutrient intake, including:

- Energy
- Protein

- Carbohydrates
- Mono- and disaccharides
- Polysaccharides
- Fat, total
- Saturated Fatty Acids (SFA)
- Monounsaturated Fatty Acids (MUFA)
- Polyunsaturated Fatty Acids (PUFA)
- Calcium
- Phosphorus
- Iron
- Magnesium
- Thiamin
- Riboflavin
- Vitamin C.

Independent Variables

Breakfast consumption (categorized by "low-quality breakfast habits or "good-quality breakfast habit").

Control Variables

Researchers controlled for BMI and education [‘general’ education (mainly theoretical courses) and vocational training (based on practical skills)].

Description of Actual Data Sample:

- *Initial N:* 341 adolescents (129 boys and 212 girls)
- *Attrition (final N):*
  - One-time data collection no attrition
  - 341 adolescents (129 boys and 212 girls)
- *Age:* 13 to 18 years
- *Ethnicity:* Belgian
- *Other relevant demographics:* None
- *Anthropometrics:* No significant differences
- *Location:* Ghent (Belgium).

Summary of Results:

- The energy contribution of breakfast to daily energy intake was on average 15.7% in boys and 14.9% in girls
- Significantly more overweight girls (N=19 vs. 11) and significantly more girls following vocational training (N=69 vs. 42) were categorized as eating a low-quality breakfast
- In boys, the energy contribution of polysaccharides was significantly higher in consumers of good-quality breakfasts

- The intake of all selected micronutrients was significantly higher in boy and girl consumers of good-quality breakfasts.

	Boys (N=129)			Girls (N=212)		
	Low (N=40)	Good (N=89)	P-Value	Low (N=94)	Good (N=118)	P-Value
Phosphorus	154.8 (111.99)	323.1 (144.62)	<0.001	125.6 (107.44)	291.9 (157.57)	<0.001
Iron	1.6 (1.11)	2.7 (1.40)	<0.001	0.9 (1.03)	2.1 (1.16)	<0.001
Magnesium	33.1 (22.64)	66.8 (30.25)	<0.001	25.7 (17.71)	56.8 (27.54)	<0.001
Thiamin	0.2 (0.11)	0.3 (0.19)	<0.001	0.1 (0.12)	0.3 (0.16)	<0.001
Riboflavin	0.2 (0.19)	0.5 (0.31)	<0.001	0.2 (0.21)	0.5 (0.29)	<0.001
Vitamin C	3.2 (8.61)	17.1 (25.95)	<0.001	7.9 (14.28)	18.1 (21.27)	<0.001

In girls, the total energy intake and the proportional intake of proteins and polysaccharides were significantly higher in consumers of good-quality breakfasts.

	Girls (N=212)		
	Low (N=94)	Good (N=118)	P-Value
Energy	196.3 (1,113.89)	371.8 (119.34)	<0.001
Protein	12.1 (6.42)	14.1 (3.47)	<0.001
Polysaccharides	23.4 (15.36)	29.7 (9.62)	0.002

The proportional contribution of total fat, monounsaturated and polyunsaturated fatty acids was significantly lower in girls who were consumers of good-quality breakfasts.

	Girls (N=212)		
	Low (N=94)	Good (N=118)	P-Value
Total fat	36.5 (5.44)	34.6 (4.39)	0.005
MUFA	14.1 (2.81)	12.7 (2.17)	<0.001
PUFA	5.9 (1.62)	5.4 (1.25)	0.005

In all adolescents, consumers of a good-quality breakfast had significantly higher intakes of bread, fruit, vegetables, milk and milk products and fruit juice, while intake of soft drinks was significantly lower than in consumers of low-quality breakfasts.

Author Conclusion:

- Consumers of a good-quality breakfast had a better overall dietary pattern on a nutrient and food group level, than consumers of a low-quality breakfast
- A daily breakfast, including whole-grain products, fruit and (semi-) skimmed milk products or an alternative source of calcium, is recommended.

Reviewer Comments:

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes

2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	No
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes

5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	N/A
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	N/A

7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes